
A Review of Articles Using Observation Methods to Study Creativity in Education (1980–2018)

ABSTRACT

This paper reports on an integrative literature review of published articles that used either quantitative or qualitative observation methods to research creativity in learning contexts. Observation is an empirical research method used in quantitative and qualitative naturalistic studies focused on understanding behavior and interactions as they unfold in real-time, which makes it particularly salient for examining the processes associated with the generation and adoption of creative ideas. However, observation remains underutilized in the field of creativity studies, partly because data collection can be time and resource intensive, but also because there are a lack of protocols and recommended research practices for observing creative thinking and problem solving in an educational environment that covers all phases of design, collection, analysis, and reporting. Thirty-seven articles from 1980–2018 were reviewed along seven dimensions: definition of creativity, unit of observation, observer role, observation sampling method, research design, data collection, and data analysis. The paper concludes with five recommendations for using observation to advance the state of research on creativity and education.

Keywords: observation, methods, quantitative, qualitative, creativity.

The purpose of this paper is to report on an integrative literature review of 37 articles that used quantitative or qualitative observation methods for studying creativity processes and products in learning contexts. Attempting to capture the creative process as it unfolds in real time is a challenge for social scientists. The creative process refers to individual psychological phases of generating creative products in a learning context (Cropley & Cropley, 2010), and also includes the inherently social ways in which individuals influence each other during this process. Most creativity studies are informed by psychological research methods and thus favor quantitative methods, specifically in the tradition of psychometrics (e.g., Plucker & Makel, 2010a, 2010b; Plucker & Renzulli, 1999). Within the field of education, the majority of studies on creativity focus on talented and gifted student identification and checklists of student creative behavior (Plucker & Makel, 2010a, 2010b) or assessment of creative tasks such as divergent thinking or creative problem solving (Kaufman, Plucker, & Baer, 2008).

However, these studies do not account for the creative process, which is to say how individuals produce and develop ideas *leading up* to creative solutions or products. Few qualitative studies on creativity exist, and even fewer studies use observation as a primary source of data. Thus, educators and researchers interested in learning about methods to account for creativity as it unfolds, in the moment, may find it challenging to find published studies on the topic. In particular, the rarity of observational research on the creative process makes it hard to generate applied recommendations concerning the support or hindrance of the development of creativity in fields like education. Without observation studies of teacher-student interactions, it will remain difficult for educators to glean insight and better promote creativity in students. The dominance of product-only assessments of creativity in research explains, in part, why educators struggle to develop concrete curricular and instructional practices that support the dynamic and developmental nature of creativity (Cohen, 1989 in Cho, Chung, Choi, Seo, & Baek, 2013).

Creativity researchers have attempted to develop creativity assessments that are flexible and adaptive to learning contexts, such as the experience sampling method (ESM). ESM was developed to survey persons as they think and feel during a series of moments, that when analyzed and aggregated together, can be interpreted to typify certain experiences (Hektner, Schmidt, & Csikszentmihalyi, 2007). Much of this work was based on the problem finding of painters as they constructed their paintings (Getzels & Csikszentmihalyi,

1976). The drawback of ESM is that it does not represent the entirety of the creativity process. Other more recently developed empirical methods for capturing creativity processes include the microgenesis method (Glăveanu & Lahlou, 2012) entailing first person accounts of activities, but for those students and researchers interested in studying comprehensively the creative process in educational contexts, observation remains an important consideration. Observation refers to the process of collecting data through observing behaviors, interactions and discussions in an individual or group setting (Merriam & Tisdell, 2016). We begin with a brief overview of observation as a research method and distinguish quantitative from qualitative observation, describe the methodology used to review the articles, and then provide results of the review. The paper concludes with recommendations for advancing the adoption of observation methods for creativity research and theory.

OVERVIEW OF OBSERVATION AS A RESEARCH METHOD

Observation is an empirical research method for generating accounts of first-hand, real-world naturalistic events to gain insight into their defining characteristics, and contextual and time-sensitive qualities (Berg, 2004). It's challenging to find a definition of observation that encompasses both quantitative and qualitative approaches because the epistemological perspectives differ. Behavioral observation focuses on the a priori identification of the presence and extent of certain behaviors, meticulously coded. Qualitative observation does not necessarily define specific behaviors to look for a priori but focuses on processes and interactions, described inductively, posteriori.

In the social sciences, observation stemmed mostly from late 19th century ethnographic research practices where participant observation was used as a form of the scientific method (Tedlock, 2005). However, this form of participant observation implied a clear split of the observer from the observed, creating an imbalance of power about how people were portrayed in observation notes and the inferences derived from those notes reported as study results. That issue opened up a debate on the purpose of conducting observation and the best ways to conduct observation, with a focus on researcher bias and its role in observation. Social scientists have questioned the relationship of the observer to the observed, and delineated different ways to conduct observations with respect to potential researcher bias.

Researcher bias refers to the tendency that researchers using either quantitative or qualitative methods may intentionally or unintentionally be selective in their observations and find what they want to find (Johnson, 1997; Shadish, Cook, & Campbell, 2002). The term "reactivity" refers to how the observer might impact the setting being observed (Denzin, 1970; Schwartz & Schwartz, 1955). Social scientists such as Becker (1958) helped proffer the use of "participant observation" as immersing oneself in a social setting without a priori conceptions. In both quantitative and qualitative research, most researchers accept that validity represents a property of meaning, interpretation, and inference that depend on the qualities of the theoretical framing and methods (Anderson, Guerreiro, & Smith, 2016; Johnson, 1997; Kane, 1992; Messick, 1995).

QUANTITATIVE BEHAVIORAL OBSERVATIONS

The experimental study of the environment and its impact on behavior (Skinner, 1964) informed the practice of behavioral observations. In quantitative observation methods, the researcher records scores on a checklist regarding individual behavior (Creswell, 2008). The scorer uses a checklist to examine whether certain behaviors or interactions occur, as well as the extent to which they are employed. Behavioral observations are time-consuming and require training to ensure fair and reliable scoring of behavior across various contexts.

In educational contexts, behavioral observations might concentrate on which students, and how many students, engage in specified tasks. Observers interested in teachers' instructional practices might document the actions observed through frequency counting on a checklist or through detailed field notes that later serve as the data source for scoring. To study learning environments researchers must systematically code communication, interaction, and events among stakeholders (Fraser, 1998). Rhodes (1961) model of the Four Ps (*person*, *process*, *product*, and *press*) is useful for clarifying the different applications of behavioral observation protocol. The use of rating checklists to identify the highly creative or gifted *person* has a long history in education (Plucker & Makel, 2010a, 2010b; Treffinger, Young, Selby, & Shepardson, 2002). Generally, those checklists focus exclusively on the individual *person* with the aim to quantify attributes and traits that indicate creative promise or talents, and thus are not considered a form of observation data. This review focuses on the use of observation to study the aspects of *process* and *press* in creativity.

QUALITATIVE NATURALISTIC OBSERVATION

Qualitative, or naturalistic, observation involves immersive fieldwork for the “systematic noting and recording of events, actions, and interactions” of social settings (Rossman & Rallis, 1998, 136–7). Observation is a central part of qualitative research in the social sciences, including anthropology (Angrosino, 2005), sociology (Schutt, Blalock, & Wagenaar, 1984), education (Rossman & Rallis, 1998), and to a lesser extent, psychology (Gergen & Gergen, 2014). Even if a researcher has experience conducting observations, observation remains one of the most difficult qualitative research skills to teach (Waite, 2014). One reason is that a researcher explores different types of observation to decide which type is most suitable for the study, which has been dubbed the “changing observation role” (Creswell, 2008, p. 223).

There are at least four distinct types of observation roles: complete participant, participant-observer, observer-participant, and complete observer (Merriam & Tisdell, 2016). *Complete-participant* means concealing one’s identity as a researcher and therefore is not used frequently in research where vulnerable populations (e.g., minors) or ethics would be violated, such as educational settings. *Participant-observation* focuses on the researcher engaging in the same activities alongside research participants in the study, without concealing one’s identity. *Observer as participant* places the role of observation first, and role of researcher/participant second. Lastly, *complete observers* are the most removed from the experience of research participants [e.g., observing behind a one-way mirror or in a crowded public place (Merriam & Tisdell, 2016)]. Eyewitness accounts of social settings obtained through observations are extremely important for verification, authentication, and validity purposes in qualitative research (Angrosino, 2005; Mishler, 2010). Therefore, in order to study creativity processes, development, and environments, training is needed to observe a social setting and write up strong observation records.

METHOD

We used the integrative literature review method as outlined by Cooper (1982), who proposed scientific guidelines for conducting reviews. Other researchers have adapted this general methodology to literature reviews in the area of creativity and education, such as the systematic review of publications on creative learning environments (e.g., Davies et al., 2012). We used these basic steps: identify research questions and search criteria and parameters, define the process of data extraction, present results, discuss limitations, and produce recommendations for further research. The research question was, “What published articles use quantitative/behavioral observation or qualitative/naturalistic observation to study creativity in educational contexts?”

The search criteria included the terms “observation/observational methods/or observational learning,” combined with “education,” and “creativ*,” “think,*” “problem solv*,” or “behav*” for peer-reviewed, empirical articles in PsycInfo, Education Resource Information Complete, Education Research Complete as well as individual journal websites. The range of dates was fluid at first. As we found few recent studies for some observation methods, the range was expanded to 1980–2018 (ending in February 2018 before submission of this article). Exclusion criteria were articles that used teacher identification checklists of creativity in students, or articles that were policy reports, descriptive educational reports, or opinion articles. We selected articles that clearly used observation as the sole or one of several empirical research methods as defined by methodologists in education and in psychology (see section above). Articles that used the term “observation,” yet did not employ observation as an empirical research method, were eliminated (such as “students were observed,” but there was no systematic collection or analysis of data).

Articles were stored in a cloud-based server, reviewed, and discussed by the research team. Several review categories were considered and a final set of seven categories were decided upon due to their relevance across both quantitative and qualitative observation research: (a) definition of creativity, (b) unit of observation, (c) observer role, (d) observation sampling method, (e) research design, (f) data collection, and (g) data analysis. Each article was screened to determine if it could be reviewed along these categories. The results were organized according to quantitative and qualitative observations.

RESULTS

QUANTITATIVE ARTICLES USING BEHAVIORAL OBSERVATION

To date, published research articles using quantitative methods to observe creativity in learning environments have been limited. Eight articles were found in ERIC and PsycInfo databases from 1980–2018 that clearly indicated the use of quantitative observation methods for studying aspects of the process or environmental press related to creativity. Instrument development spanned multiple domains and purposes. Four

measures focused on environmental or instructional support for creativity across multiple domains in K-12 educational settings (5), in K-12 science classrooms (1), and physical education class (1). One observation study (1) examined the creative process in improvisational dance and movement, and another (1) studied aspects of the creative process in artistic, constructive, and written tasks. Table 1 pinpoints the strengths and weaknesses of these quantitative studies. Here, the studies are reviewed along the seven dimensions.

Definition of “creativity”

The reviewed studies varied in how explicitly they defined creativity. Most studies developed a framework of creative teaching behaviors through exhaustive reviews of research on creativity and instruction in a particular area of learning (Al-Abdali & Al-Balushi, 2016; Konstantinidou & Zisi, 2017; Pitts, Anderson, & Haney, 2018; Richardson & Mishra, 2018) and, in some cases, compared findings from past research with their own field notes. Konstantinidou and Zisi (2017) adapted an extant self-report measure aligned to Cropley’s (1997) framework to create a short behavioral observation checklist of the environment. Al-Abdali and Al-Balushi (2016) framed their approach specifically around science teaching for creativity. Pitts et al. (2018) integrated multiple theories of creativity with Glăveanu (2013) Five As model of creativity—an update of the Four Ps model—to bridge student creative development to instructional practice in the classroom. Gadjia, Beghetto, and Karwowski (2017) observed both teachers and student behaviors separately using a checklist of exemplary creative behaviors in teaching and learning. That checklist of behaviors emerged from a thorough review of the literature on supportive teacher behaviors for student creativity in learning and the types of student behaviors and interactions that contribute to a supportive environment for creative learning. In more exploratory studies, theory guided an inductive process (Ruscio, Whitney, & Amabile, 1998).

The strongest approaches to observation in learning environments converged extant classroom observational approaches and instructional theory with creativity theory (Al-Abdali & Al-Balushi, 2016; Furman, 1998; Gadjia et al., 2017; Pitts et al., 2018; Richardson & Mishra, 2018). For example, Richardson and Mishra (2018) developed categories from creativity research and extant observation protocol used by school administrators, took field notes in peer-nominated creative classrooms to refine the tool, and received input from practitioners. Furman (1998) incorporated the Origin-Pawn Questionnaire (deCharms et al., 1976) as a criterion for assessing the level of support in the classroom climate for cognitive, social, and emotional aspects of creativity. Additionally, both Gadjia et al.’s (2017) and Pitts et al. (2018) included observation of teacher and student behaviors for distinct contributions to a supportive learning environment, providing two different successful approaches. Studies that did not integrate an instructional framework into their observation protocol struggled to align to typical educational environments or instructional practice. The strongest approaches linked creativity theory explicitly to frameworks for instructional practices. As a result, these articles went further to inform theory, future research, and educators’ understanding of creativity.

Unit of observation

One of the studies reviewed focused on the individual in a laboratory setting (Ruscio et al., 1998); all others conducted observation at the classroom level. The object of observation in those studies often integrated teachers’ instructional practice, classroom management, and overall climate with student creative thinking and behavior in response to instruction. The two studies using quantitative observation to examine the creative process closely differed substantially. Ruscio et al. (1998) sought to accurately record and measure the creative process of individuals using observation alongside verbal description. Torrents, Castañer, Dinušová, and Anguera (2010) developed an observational approach to measure creative movement and motor skill in the specific format of contact improvisation. Both studies used an inductive approach to discover the most salient aspects of the creative process.

Observer role

Though researchers rarely specified the role of the observer, they used observer as participant in most cases. The one exception, Ruscio et al. (1998), used a complete observer role, coding observations of the creative process using video recordings of individuals’ behaviors. The common approach to embed the researcher in the classroom as a participant with minimal involvement sought to achieve maximum objectivity and minimal reactivity of participants; however, that assumption was not tested in practice.

TABLE 1. Strengths and Weaknesses of Articles Using Observation of Creativity in Educational Contexts ($N = 36$ Articles) (1980–2018)

Dimension of review	Quantitative observation articles ($n = 08$)		Qualitative observation articles ($n = 28$)	
	Strengths	Weaknesses	Strengths	Weaknesses
1. Definition of “creativity” in observation studies	Four Ps framework; Inductive-deductive process; Explicit link to instructional practices or learning environments	Inclusion of too many theories may limit clarity and contributions to theory building	Cognitive components Esthetic and flow states Creative processes, products and assessment	Creativity defined in numerous ways including terms such as “imagination”
2. Unit of observation	Classroom; teacher; individual in the creative process	Lack of alignment between context and protocol design	Classroom environment; Student cases; Teacher cases	Unspecified or general activities observed
3. Observer role	Direct observation; Observer as participant	Not always specified; assumed objectivity not explicit	Participant observer	Role unspecified
4. Observation sampling method	Purposive sampling; Peer-nominated for creative teaching; multiple grade levels	Convenience sampling; limited generalization beyond specific context of study	Critical incident sampling; Purposive sampling	Sampling method unspecified; No reason provided for sampling classrooms
5. Research design	Exploratory, non- or quasi-experimental; Measurement of quantity and quality of support for creativity; linking student perceptions to observation data	Limited to descriptive and associational designs; cross-sectional mediation analysis	Case study; Ethnography; Action research	General qualitative methodology; Unspecified mixed methods or multi methods
6. Data collection	Field notes used to rate quality and quantity of observed behaviors; Frequency counts of behaviors; Behavioral coding of videotaped tasks; Notation of evidence; Multiple observation instances	Unspecified rating levels on rubric; Categories and indicators misaligned to instructional norms and naturalistic setting	Videotaped observation; Thick description of teacher modeling use of art materials; Photographs of student work and collaborations	Process of collecting and generating notes and coding them not explained
7. Data analysis	Structural equation modeling of observed constructs and indicators; Mediation analyses to test creativity theory; Analysis at the indicator level; use of intra-class coefficient	Limited to descriptive statistics only	Constant comparative method; Content analysis; Interaction analysis; Semantic analysis; Symbolic interactionism	Observation data is blended with interview and survey results; Observation data not reported even though collected

Observation sampling method

Purposive sampling was used most often in order to capture variance in the classroom conditions for creativity. For instance, in their exploratory study, Al-Abdali and Al-Balushi (2016) selected a broad range of grade levels in order to evaluate support for creativity broadly. Pitts et al. (2018) sampled purposively in traditional content area classes and multidisciplinary arts integration classes to test the effectiveness of the observation measure for comparative analyses across these contexts. Similarly, Richardson and Mishra (2018) used peer-nomination for creative teaching to test the relevance and coherence of early versions of their measure. Gadjia et al. (2017) compared observation scores between classrooms previously identified as having a null, positive, or negative relationship between students' creative ability and academic achievement. Generally, sampling decisions appeared to emerge from reasons of convenience rather than analytic power or randomization.

Research design

Henriksen, Mishra, and Mehta (2015) found that only three percent of creativity assessments included the learning environment using observation or other methods. Likely in response to that paucity of measures, four of the eight studies identified in our search emerged between 2016–2018, and each of those studies designed new observation tools and protocol to assess the classroom environment. Those contemporaneous studies and the others reviewed differed substantially in research design and approach to measure development, providing the field different examples to draw on.

Schacter, Thum, and Zifkin (2006) investigated the relationship between teaching in support of creativity and students' subsequent academic achievement. Conversely, Gadjia et al. (2017) sampled classrooms based on level of correlation between students' creative potential and academic achievement to observe if the student and teacher behaviors that contributed to a supportive environment differed between those classrooms. Al-Abdali and Al-Balushi (2016) developed their observation protocol for exploratory purposes to learn which aspects of support for creativity are most frequent in science instruction. Furman (1998) aligned an observational checklist to a survey of student perceptions to learn about underlying relationships between the two forms. Furman also designed the observation form to code sequences of interaction units between teacher and student so that researchers could fully trace those processes in analyses. Richardson and Mishra (2018) developed their measure primarily to be used by educators and school administrators to help improve the design of learning environments to support creativity in learning. Konstantinidou and Zisi (2017) produced an 18-item checklist for evaluative purposes to detect the level of support for creativity in physical education classes. Whereas most designs required observers to check behaviors observed directly, Schacter et al. (2006) and Pitts et al. (2018) developed observation protocol that used ethnographic field notes to record objective observations prior to subjective scoring. The purposes driving the research design included exploration, theory testing, evaluation, and practitioner improvement.

Data collection

In general, reviewed studies reported on early use of different observation protocol and reporting; often, data collection occurred iteratively. Researchers made different choices about the number of distinct classrooms or individuals observed and the number of observations for each classroom. For example, Schacter et al. (2006) observed 48 elementary school teachers eight times each for a whole class period at different times of the day using ethnographic field notes as the basis for ratings. Some studies provided extensive detail about the procedures used to observe and rate the environment (Gadjia et al., 2017; Konstantinidou & Zisi, 2017; Pitts et al., 2018; Richardson & Mishra, 2018; Schacter et al., 2006) and others provided much less specificity (Al-Abdali & Al-Balushi, 2016; Furman, 1998; Ruscio et al., 1998). Notably, Gadjia et al. (2017) scored behaviors dichotomously (i.e., present or not present) at five-minute intervals during observations generating 90 observational units for student and teacher behaviors clustered within 10 classrooms.

Data analysis

Scoring procedures dictated the analytic approach for the observations. Across protocol, researchers kept the number of indicators below 20. Most studies used a Likert scale rubric with ratings (e.g., from "no evidence" to "fully present"); only Konstantinidou and Zisi (2017) and Torrents et al. (2010) used a behavioral checklist with actual frequency counts. Most studies included more than one observation instance in their data collection (Konstantinidou & Zisi, 2017; Schacter et al., 2006) and Ruscio et al. (1998) used the observation ratings of individuals' engagement with tasks from three different domains. Studies, generally,

TABLE 2. Recommendations for Using Observation in Creativity and Educational Studies

Recommendations for using observation	Questions to drive design and planning of observation studies	Observation data collection practices	Observation data analysis practices
1 Adopt a critical stance with respect to evidence of creativity processes	How does the study provide observation evidence of creative behavior contrasted with non-creative behavior? What are the links between specific conditions in the learning environment and creative and noncreative behaviors?	• Observer role: establish an understanding of typical or normal classroom routines and teaching behavior • Explore associations between non-creative versus creative behavior and specific environmental conditions	• Disclosure of observer role • Analyzing possible reactivity to observer • Testing for the mediation and moderation effects of specific conditions in the learning environment
2 Notate affective and expressive qualities of the creative process	How do I notate authentic qualities of the creative process during observations (validity)?	• Thick description of creative process • Using an inductive-deductive sequence within a behavioral approach (e.g., sequence of field notes to scoring)	• Thematic coding of thick descriptions • Development of behavioral observation protocol using qualitative methods to learn about context or as part of protocol
3 Preserve methodological integrity of observation data by disentangling it from other creativity data	What is the distinct purpose of observation compared to other data sources? What does the observation data reveal about creative processes?	• Connect each method to the correct research question and aspect of theoretical framework • Clarify sampling strategy for observations	• Triangulation of data after analysis • Contrast data in results when there is divergence, not just convergence across data sources

TABLE 2. (Continued)

Recommendations for using observation	Questions to drive design and planning of observation studies	Observation data collection practices	Observation data analysis practices
4 Contextualize and capture variance in creative processes	Do any instructional frameworks exist that are relevant to my context of interest and can inform my approach to observing conditions for the creative process? Can I visit the observation site multiple times?	• Integrate existing frameworks or measures that are relevant to context • Represent theoretical variance in teacher and student creativity • Revisit the same observation site • Observe different learning environments	• Analyze change over time and over units of observation • Analyze quality and quantity of behaviors • Analyze links between different data sources
5 Provide both discrete and aggregated instances of observed creative processes	How do I describe each seemingly fleeting instance of creativity with precision during the observation?	• Identify the boundaries of each creative process	• Articulate instances or episodes of creativity • Aggregate instances of creative processes

reported inter-coder reliability, using the 80% threshold of interobserver agreement to document reliability of multiple raters. Some researchers explored what different levels of frequency or quality might indicate for theory and practice (Al-Abdali & Al-Balushi, 2016; Konstantinidou & Zisi, 2017; Schacter et al., 2006; Torrents et al., 2010). Pitts et al. (2018) reported reliability using the intra-class coefficient for each domain and used analysis of variance to compare observation scores of arts integration classrooms to traditional classrooms. Gadja et al. (2017) generated visual diagrams from the observation units to identify patterns of interaction among teachers and students and clarify which patterns may be more or less supportive of creative learning. In their analyses, most of the studies reported the descriptive statistics for each category or domain of indicators. Furman (1998) compared the frequencies of individual teacher behaviors for a creative climate between two groups of teachers in their study: teachers who scored low and high based on student perceptions.

Each study sought to solidify initial validity and usability of the instrument for observation of creativity in context. Al-Abdali and Al-Balushi (2016) among others used a panel of judges germane to the context (e.g., science educators) to evaluate the face validity of the protocol and improve its practical significance. Generally, these quantitative studies represent early, exploratory work to push theory about the creative process forward and to improve the press of learning environments in support of creativity. As such, each study provides organizational, methodological, and technical lessons that can support future creativity research.

QUALITATIVE ARTICLES USING NATURALISTIC OBSERVATION METHODS

The overarching contribution of qualitative observation research to the field of creativity is the articulation of explicit examples of modeling, communication, and interactions in creativity in specific domains. In

general, qualitative observation methods are more prevalent than quantitative and mixed methods studies for observing creativity in learning environments. Twenty-eight articles were found in ERIC and PsycInfo databases from 1980–2018 using qualitative observation methods for studying creativity processes including visual art (14), music education (03), theater (03), fashion (01), science, computer science, and mathematics education (05), early childhood/non-domain specific (01) and technology (01). Articles that referred to observation as a more casual term without a systematic collection and analysis of observation data separate from other forms of data (e.g., interviews, surveys) were eliminated from the review. Table 1 pinpoints the strengths and weaknesses of reviewed studies.

Definition of “creativity” in observation studies

Some authors elected to include multiple definitions of creativity (Pitri, 2013), which made it difficult to pinpoint the study’s contributions to specific creativity theories. Emphasis on cognitive components included divergent thinking, convergent thinking, fluency, and flexibility (e.g., Karademir, 2016). Problematically, Robson and Rowe (2012) used a standard creative thinking framework that conflated “imagination” with “creativity,” which they then proceeded to explain in terms such as originality and novelty, and even critical thinking. In arts and music education studies, there was a shift in creativity focus from cognitive components to more expressive qualities such as collaboration (Biasutti, 2015), teaching method, modeling, and employment of art materials (Budge, 2016; Geist & Hohn, 2009; Guay, 2000; James, 1997; Kandemir & Gur, 2007; Lorimer, 2016; Mars, 2016; Thomas, 2009; Walker, 2014), creative “encounters” (Petsch, 2000), esthetic or flow experience (Vuk, Tacol, & Vogrinc, 2015) and transformation (Walker, 2014).

Unit of observation

Declaring the unit of observation helps the reader focus on the amount and type of individuals included in the observation: student(s), teacher(s), groups, classrooms, and schools. Therefore, it’s important to identify what activities, behaviors, and interactions are to be observed (Maxwell, 2010; Merriam & Tisdell, 2016; Patton, 2002). In our review, ambiguous descriptions did not clarify whether the intent was to encompass all the activities of the entire classroom, or relatively smaller clusters of group interactions. The most prevalent unit of observation was the classroom environment as indicated in eight articles (Cho et al., 2013; Cheung, 2012; Coulson & Burke, 2013; Guay, 2000; Meyer & Lederman, 2013; Nemiro, Larriva, & Jawaharlal, 2017; Petsch, 2000; Schacter et al., 2006). We note four exceptions to classroom as the designated unit of observation: Biasutti (2015) focused more narrowly on students and teachers learning music in an online setting, and Budge (2016) examined interactions between teachers and students while learning art. Wielgosz and Molyneux (2015) classified the student as the unit of observation, and Robson and Rowe (2012) further narrowed down the unit of observation to child-initiated and adult-initiated activities.

Observer role

When observing the learning process, some researchers argue for participating alongside students. Feelings like empathy can enhance the understanding of research participants’ experience as opposed to producing bias (Bogdan & Biklen, 2007), thus enhancing the validity of qualitative findings. Most studies, though, did not disclose which of the four types of observer role were used (e.g., Walker, 2014). Of those articles that did include a description of the observer role, most chose participant (Budge, 2016; Guay, 2000; Katz-Buonincontro, 2011, 2015; Mars, 2016; Petsch, 2000), or were intricately involved in understanding student work in the classroom (Donovan, Green, & Mason, 2014; James, 1997; Lorimer, 2016; Pitri, 2013; Thomas, 2009).

Observation sampling method

Several articles omitted a citation on the process for collecting observation data (e.g., Budge, 2016; Geist & Hohn, 2009; Godart & Mears, 2009; Kandemir & Gur, 2007; Lorimer, 2016; Mars, 2016; Pitri, 2013; Robson & Rowe, 2012; Sullivan, 2011; Vuk et al., 2015; Walker, 2014; Walmsley, 2013). In those cases, it was difficult to determine how researchers made decisions about data saturation, or when the researcher’s understanding of the enactment of creative processes was relatively complete with no further, new data emerging. Critical incident sampling, where a case or participant is sampled as an important example of a construct (Patton, 2002), was used in one article; surveys and interviews led to the selection of three students for classroom observations based on their use of creativity in science (Meyer & Lederman, 2013). Other studies sampled students identified as gifted (e.g., Karademir, 2016), and then proceeded to conduct observations.

Research design

While some articles described the research focus, such as teaching method (Walker, 2014), professional development (Lorimer, 2016), and student art activities (Pitri, 2013; Thomas, 2009), the larger research design remained obscure. Designs included case study (James, 1997; Karademir, 2016; Katz-Buonincontro, 2011, 2015) and ethnography (Guay, 2000; Mars, 2016; Petsch, 2000), which is frequently associated with the method of observation as defined in the APA standards for reporting qualitative research (Levitt et al., 2018). With respect to connecting creativity to learning, attempts were made to tie general pedagogy to teaching for creativity in specific subjects: Meyer and Lederman (2013) and Sullivan (2011) mapped science instruction to the demonstration of creativity and Donovan et al. (2014) mapped creativity to technology. Conversely, other studies used an inductive framework: Robson and Rowe (2012) first identified child-initiated activities, which were then interpreted as supportive of creative thinking (p. 355) and Walmsley (2013) first participated in a theater process, then interviewed other participants characterizing aspects such as “creative energy” and its “rawness” (p. 114).

Data collection

The term “thick description” has been adopted by researchers as the gold standard of observations (and sometimes case studies) (e.g., Geertz, 1973). Observation notes and themes are often used in conjunction with interviews to corroborate themes and thus establish validity from one data source to another (Waite, 2014). Thick description (Geertz, 1973; Rile, 1949) of the creativity process was evident in the following 11 articles: modeling in art instruction (Budge, 2016) and online music collaboration (Biasutti, 2015) and student-teacher interactions (James, 1997; Thomas, 2009). Videos and photographs of student drawings and creative projects (Karademir, 2016; Katz-Buonincontro, 2011, 2015; Lorimer, 2016; Pitri, 2013; Vuk et al., 2015; Walker, 2014) strengthened observation descriptions.

Data analysis

In some articles using mixed methods and multiple methods, qualitative observations were often used to triangulate—that is, confirm or disconfirm—other types of data (e.g., survey, interviews, and focus groups). Often, observation data were overshadowed by interview and survey results (Bertling, 2015; Catterall & Pappeler, 2007; Lorimer, 2016). It was hard to link specific results back to observation data and, therefore, difficult to determine how observation contributed to a conclusion about the nature of creativity (Godart & Mears, 2009; Watson, 2014). In addition, many studies did not detail data analysis procedures or cite methodology (Donovan et al., 2014; Geist & Hohn, 2009; Kandemir & Gur, 2007; Lorimer, 2016; Petsch, 2000; Pitri, 2013; Robson & Rowe, 2012; Walmsley, 2013).

Likewise, the coding method for deriving codes, categories or themes were not used, or if they were used, methodologists were not cited (Budge, 2016; Cho et al., 2013; Coulson & Burke, 2013; Geist & Hohn, 2009; Godart & Mears, 2009; Kandemir & Gur, 2007; Lorimer, 2016; Pitri, 2013; Walker, 2014; Walmsley, 2013; Wielgosz & Molyneux, 2015). Examples of well-articulated coding of observations included the constant comparative method—a systematic approach to coding used in grounded theory methodology (Strauss & Corbin, 1998)—(Katz-Buonincontro, 2011, 2015; Meyer & Lederman, 2013), content analysis method (Karademir, 2016), interaction analysis examining routine practices of individuals and their environment (Jordan & Henderson, 1995) (Sullivan, 2011), semantic analysis (Thomas, 2009) and symbolic interactionism (James, 1997), or how people interpret meaning from symbol systems (Blumer, 1980). However, even with some of these coding methods, it was hard to discern the preparation of field notes for analysis and the identification of discrete codes relating to final, larger themes reported as “results.”

REVIEW LIMITATIONS

Our review was limited to the articles found in our database search ($N = 37$ Articles) (1980–2018), but other articles might have been missed due to human error or being under review/in press while the manuscript was written as the search concluded in February 2018. It is possible that the database subject identifiers may have missed a few studies that used observation but did not list “observation” as a keyword. This review did not include dissertations that might be relevant, too. With the aim to be concise we provided only a limited number of examples in each review component from the collection of studies we reviewed. We encourage readers to go to the original source for additional details about the observation methods and results based on which examples appear to be most relevant to the aims of their research.

LIMITATIONS OF OBSERVATION METHODS USED

Our review found more use of qualitative observation methods in the study of creativity than quantitative observation methods. The majority of the reviewed quantitative observation studies were published between 2016–2018. Therefore, the field appears to be in the nascent stages of development for conducting behavioral observations creativity in the classroom. While several researchers have written on the importance of observation and the process of conducting observations, comparatively less attention is paid to what constitutes a well-written observation—specifically how observation can be used to document and unpack creativity processes, with attention to issues of validity, triangulation, and reliability standards.

Our review indicated that future research should be more precise about which creativity theories fit the purpose and conditions of the setting. Moreover, explicitly integrating creativity theory with instructional theory aligned to the context is key. As our review illustrates, observational methods hold promise to support theoretical refinement in creativity research. Theoretical precision in observation protocol development and data analysis remain important for contributing further research in the area of creativity in education. Thus, we offer the following five recommendations to advance the state of observation research in the area of creativity in learning contexts.

RECOMMENDATIONS

RECOMMENDATION #1: FOCUS ON BARRIERS TO CREATIVITY IN OBSERVATIONS

On the whole, the reviewed observation studies did not focus on teacher and student behaviors that appeared to stymie or inhibit creativity. Rather, the studies looked solely for evidence of interactions, instruction, and evidence of creative thinking and behavior. This choice exposes a research assumption to sample sites where creative thinking and behavior are expected to occur. None of the studies examined day-to-day or typical teaching or learning behavior, and then parsed out creative as opposed to *uncreative* behaviors and supports. Studies using quantitative behavioral observation methods found little evidence of support for creativity in a range of educational settings, such as middle and high school science, English language arts, and physical education classrooms. Unfortunately, none of those studies included the study of environmental or instructional factors that might stymie student creativity.

Generally, the relative nature of creativity within an educational experience appears to be neglected often in observation studies. Therefore, we recommend that researchers adopt a critical stance about creativity as situated in the context of the demands of curriculum and instruction. For instance, when observing for the support of creativity through open-ended questions, researchers could also include indicators that emphasize close-ended questions where teachers seek out a single right answer. Researchers can include observational indicators of conditions and practices that either inhibit or support creativity.

Deriving evidence of creativity processes, and the conditions that inhibit or support it, ties to the declaration of the researcher's observer role and requires a critical stance as well. Researchers with a strong ethnographic lens tend to participate in the learning activities they are observing and clearly articulate their participant-observer role. Many classroom studies, however, fail to disclose the type of role that the observer plays. Therefore, it can be difficult to understand how the researcher may have affected the teaching and learning activities.

RECOMMENDATION #2: NOTATE AFFECTIVE AND EXPRESSIVE QUALITIES OF THE CREATIVE PROCESS

Researchers tended to underemphasize the potential of observation for documenting and analyzing the nature of creativity processes. Therefore, we recommend exposing the range of affective and expressive qualities as they unfold during the creative process. Affective qualities pertain to the full range of outward emotion expression including visual facial expressions indicating enjoyment and frustration, both in students and in teachers. Inclusion of in vivo expressions that participants utter during observations such as reference to the "rawness" of cocreating theatrical productions (Walmsley, 2013) help the reader understand the micro-genetic, or first-person accounts, of the creative process (Glăveanu & Lahlou, 2012).

Expressive qualities of the creative process refer to how people use their senses to experience vital elements of creativity. These qualities tend to get lost in observation accounts. Examples of expressive qualities include the sound of music, the buzz of student collaboration, the visuals of a classroom display showcasing art, the feel of materials such as the wetness of clay, and the olfactory aspects such as the smell of wood burning using a hacksaw in a STEAM engineering woodshop. Overall, the lack of attention to these qualities runs counter to the aim of conveying the essence of creative encounters like flow and esthetic experiences.

Visuals such as video stills, photographs of paintings, or students engaged in painting, were rarely used in observation methods, but have the potential to enrich observation passages.

In classroom visits, we recommend that researchers do an initial scan of the observation setting to record what they see, hear, and smell in relation to creativity processes in the arts. Comparing classrooms can be very informative. Some schools and classrooms celebrate the creative process prominently, and others promote a more craft-based approach that is less student-driven. Additionally, expressive qualities of the creative process may be communicated through gesture and embodied forms that only observation can detect (Goldin-Meadow, 2003; McNeill, 1992, 2005).

RECOMMENDATION #3: DISENTANGLE OBSERVATION DATA FROM OTHER DATA

We recommend that researchers preserve the methodological integrity of observation data. In this review, the method for developing an observation protocol was sometimes neglected (e.g., Kandemir & Gur, 2007; Watson, 2014). In our review, it was not always clear if the observer entered the observation site to conduct fieldwork with a protocol to guide their data collection process. Several creativity studies using multiple methods entangle the reporting of observation data with interview data, and/or survey data. In those articles, classroom “observations” were treated like classroom visits. In many articles, the phrase “observation” was used to describe creativity tasks qualitatively rather than produce an analysis of the tasks or contribute a particular insight about the task (e.g., Dulama, Alexandru, and Venea, 2010). That oversight can compromise the methodological integrity of observation data.

In articles where both interviews and observations were conducted (e.g., Kandemir & Gur, 2007), it was important to show the sequence of data collection and analysis. For example, when students were surveyed, then interviewed, and then observed, the triangulation of these three data sources needs further explanation. When studying the teaching for creativity, it is also important to compare teachers’ espoused beliefs via interviews with observations of their teaching. The rationale for sampling teachers and students should be stated. Some quantitative observation protocols for creativity incorporate qualitative data collection methods, such as field notes, into their rating process. Researchers should clarify their rationale for this “mixed methods” observation approach based on the goals of the protocol and the conditions of the setting. For instance, field notes allow the observer to refer back to the notes when making a final creativity rating using a Likert scale.

RECOMMENDATION #4: CONTEXTUALIZE OBSERVED CREATIVITY

Contextualizing observation settings is an important element of reporting research (Levitt et al., 2018). Therefore, the ability to capture variance in observed creativity is vital. Reliability in qualitative observations differs greatly from reliability in quantitative behavioral studies. Multiple observations of events can be a key reliability criterion (e.g., longitudinal data), as well as the extent the researcher conducts observations of creativity across multiple sites.

Both quantitative and qualitative observation in creativity research should seek to represent theoretical variance in teacher and student creativity. Thus, the charge for creativity researchers is to bring that variance to bear. This means paying special attention not only to salient aspects of learning environments, but also making distinctions between seemingly similar settings or time-sensitive patterns of learning. For example, in a series of qualitative naturalistic observation studies of leadership institutes using the arts (Katz-Buonincontro, 2011), problem-solving occurred on Wednesdays. Therefore, it was imperative for the observer to pay keen attention to Wednesday activities. In quantitative studies using behavioral observations of creativity, Schacter et al. (2006) demonstrated one-way for quantitative observation protocol to attend to contextual variance in creative learning environments by having observers rate for both quality and quantity of supports for creativity. That nuanced assessment allowed for more intricate analyses, such as tests of moderation, to contextualize findings, and contribute to theory and practice.

RECOMMENDATION #5: PROVIDE DISCRETE AND AGGREGATED INSTANCES OF OBSERVED CREATIVITY

Studies that provide precise instances of observed behavior help the reader understand what it is like to develop one’s creativity, especially in learning climates that are inherently social. The more precise, the better. Social settings include lots of extraneous information and thus it is challenging to pinpoint a specific creative behavior. Examples of precise instances of creative behavior include “episodes” of childhood play (Petsch, 2000); “mimicking the music teacher” (Mars, 2016), online music collaboration (Biasutti, 2015)

and teacher-student interactions (Thompson, 2007). Each of these instances employs a clean rhetorical device of pairing a brief narrative description of the episode of creativity with a passage of an individual's words or a discussion between two students or a teacher and a student. Observation passages that do not include an excerpt of conversation, remarks, or student reflections often fail to demonstrate the validity of the observation (e.g., Vuk et al., 2015). Thus, we recommend that researchers pair down an instance or episode of particularly rich interaction that relates to their framework of creativity, and capture them via audio and/or video.

Alongside examples of discrete instances, researchers should provide a macro-level view of creativity across such instances. Additionally, maps of student seating arrangements observed helps provide a sense of classroom interactions (Donovan et al., 2014). If possible, aggregating instances of creativity gives the reader a clearer picture of implications for theory and practice regarding creativity processes. For qualitative observations, another avenue for synthesis is to provide a case analysis and then analyze themes across cases (Yin, 2003). For quantitative observations, researchers can run analyses at the category or domain level of environmental and instructional factors (e.g., physical space or feedback to students). Where possible, identifying the indicators of support for creativity with the highest and lowest frequencies in each domain can inform intervention efforts more effectively. Alternatively, analysis of aggregated composite scores across domains will likely improve reliability and tests of between- and within-group differences, especially if the sample size is small—a common feature of studies reviewed.

Once reported in the Results section, observations should then be examined in light of the theory introduced in the background and literature sections. Often it is difficult to understand how observation has been used in creativity studies because authors must make a contribution to their primary field, which, more often than not, is in an education subdiscipline. Many authors sought to contribute to fields such as art education, music education, or science education, and the majority of the discussion sections did not relate observations back to creativity theories *per se*. We recommend that researchers specify research questions and hypotheses that relate creativity theory to instructional and environmental factors with as much precision as possible. Those hypotheses should incorporate prior empirical and conceptual work early in the endeavor. If those specifications are made prior to protocol development, it is more likely that observation data collection and analysis will be robust enough to move theory and practice forward.

CONCLUSION

In conclusion, quantitative and qualitative observation studies hold rich potential for advancing the understanding of creativity processes in various learning environments. Observational research that moves beyond descriptive analysis can shed light on the shifts in practice that may have the largest and most immediate effect on creativity in the process of learning content knowledge and disciplinary skills. We conclude with specific gleanings from the observation findings of the 37 studies, which contribute to our educational understanding of ways to support and promote creativity:

- 1 Teachers stated beliefs about creativity may not correspond to classroom observations of teaching (Cheung, 2012), and thus training and professional development that clarifies and bridges creativity theory to classroom practice is important (Kandemir & Gur, 2007; Kin & Wong, 2016).
- 2 Teacher modeling of how to use materials (Coulson & Burke, 2013; James, 1997), how to interpret art (Budge, 2016) and making connections to real-world scenarios (Chiu, 2007) can be essential to learning, as long as teachers don't over-rely on proscriptive activities (Geist & Hohn, 2009). Teacher and student behaviors that contribute to a supportive environment for creative learning should be distinguished in observation (Gadja et al., 2017) and, when included in analysis, can reveal patterns of interaction, modeling, and instruction, contributing to theory and practice.
- 3 Nonverbal cues can enhance expression of ideas (Biasutti, 2015) as well as the allowance of student vocalizations (Nemiro et al., 2017) in addition to direct verbal communication (Cho et al., 2013) when projects are open-ended (Mars, 2016; Sullivan, 2011) but have a clear purpose (Meyer & Lederman, 2013).
- 4 Elements of personal meaning making are critical: student efficacy in creative environments with diverse student populations relies on personal meaning making (Guay, 2000; Petsch, 2000; Wielgosz & Molyneux, 2015), which can be enhanced through opportunities to use different modalities in learning (e.g., visual, auditory, kinesthetic); Creativity can include incremental as opposed to radical

adaptations to a given form and can be based on personal taste (Glăveanu & Lahlou, 2012; Godart & Mears, 2009).

- 5 Child-initiated activities rather than adult-initiated activities may facilitate creativity in preschool children (Robson & Rowe, 2012), and peer feedback can be used effectively to foster design and creativity (Karademir, 2016).
- 6 Tapping into students' embodied creativity through movement or enacted forms can access different reserves of creative potential and opportunities in learning (Konstantinidou & Zisi, 2017; Torrents et al., 2010).
- 7 Supporting the metacognitive capacity of students can be supported by arts integration teaching strategies and help students learn when, how, and why to apply their creative skills and potential to the classroom learning context (Pitts et al., 2018).

The review, examples, and recommendations offered here can be used by students and researchers to advance best practices for creativity studies across each stage of research design, data collection, analysis, and reporting the results of observation data.

REFERENCES

*denotes articles reviewed in manuscript

- *Al-Abdali, N.S., & Al-Balushi, S.M. (2016). Teaching for creativity by science teachers in grades 5–10. *International Journal of Science and Mathematics Education*, 14, 251–268.
- Anderson, R.C., Guerreiro, M., & Smith, J. (2016). Are all biases bad? Collaborative grounded theory in developmental evaluation of education policy. *Journal of Multidisciplinary Evaluation*, 12, 44–57.
- Angrosino, M.V. (2005). Recontextualizing observation: ethnography, pedagogy, and the prospects for a progressive political agenda. In N.K. Denzin & Y.S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (3rd edn, pp. 729–746). Thousand Oaks, CA: Sage.
- Becker, H.S. (1958). Problems of inference and proof in participant observation. *American Sociological Review*, 23, 652–660.
- Berg, B. (2004). *Qualitative research methods for the social sciences* (5th edn). Boston: Pearson.
- Bertling, J.G. (2015). The art of empathy: A mixed methods case study of a critical place-based art education program. *International Journal of Education and the Arts*, 16, 1–27.
- Biasutti, M. (2015). Creativity in virtual spaces: Communication modes employed during collaborative online music composition. *Thinking Skills and Creativity*, 17, 117–129.
- Blumer, H. (1980). Comment, Mead and Blumer: The convergent methodological perspectives of social behaviorism and symbolic interaction. *American Sociological Review*, 45, 409–419.
- Bogdan, R., & Biklen, S.K. (2007). *Qualitative Research for Education: An Introduction to Theories and Methods* (5th edn). Boston, MA: Allyn and Bacon.
- *Budge, K. (2016). Teaching art and design: Communicating creative practice through embodied and tacit knowledge. *Arts and Humanities in Higher Education*, 15, 432–445.
- *Catterall, J.S., & Peppler, K.A. (2007). Learning in the visual arts and the worldviews of young children. *Cambridge Journal of Education*, 37, 543–560.
- deCharms, R. (1976). *Enhancing motivation: Change in the classroom*. Oxford, England: Irvington.
- Cheung, R.H.P. (2012). Teaching for creativity: Examining the beliefs of early childhood teachers and their influence on teaching practices. *Australasian Journal of Early Childhood*, 37, 43–51.
- Chiu, M. (2007). Approaches to the teaching of creative and non-creative mathematical problems. *International Journal of Science and Mathematics Education*, 7, 55–79.
- *Cho, Y., Chung, H.Y., Choi, K., Seo, C., & Baek, E. (2013). The emergence of student creativity in classroom settings: A case study of elementary schools in Korea. *The Journal of Creative Behavior*, 47, 152–169.
- Cooper, H. (1982). Guidelines for conducting integrative research reviews. *Review of Educational Research*, 52, 291–302.
- *Coulson, A.N., & Burke, B.M. (2013). Creativity in the elementary music classroom: A study of students' perceptions. *International Journal of Music Education*, 31, 428–441.
- Creswell, J.W. (2008). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd edn). Thousand Oaks, CA: Sage.
- Cropley, A.J. (1997). Fostering creativity in the classroom: General principles. In M. Runco (Ed.), *The creativity research handbook* (vol. 1, pp. 83–114). Cresskill, NJ: Hampton Press.
- Cropley, D., & Cropley, A. (2010). Functional creativity: “products” and the generation of effective novelty. In J.C. Kaufman & R.J. Sternberg (Eds.), *Handbook of creativity* (pp. 301–320). Cambridge, UK: Cambridge University Press.
- Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2012). Creative learning environments in education—a systematic literature review. *Thinking Skills and Creativity*, 8, 80–91.
- Denzin, N.L. (1970). *Sociological methods: A sourcebook*. Chicago: Aldine.

- Donovan, L., Green, T.D., & Mason, C. (2014). Examining the 21st century classroom: Developing an innovation configuration map. *Journal of Educational Computing Research*, 50, 161–178.
- Dulama, M.E., Alexandru, D., & Vanea, C. (2010). Studying the degree of creativity of preschool children drawings. *Acta Didactica Napocensia*, 3, 85–96.
- Fraser, B. (1998). Classroom environment instruments: Development, validity and applications. *Learning Environments Research*, 1, 7–33.
- *Furman, A. (1998). Teacher and pupil characteristics in the perception of the creativity of classroom climate. *The Journal of Creative Behavior*, 32, 258–277.
- *Gadja, A., Beghetto, R., & Karwowski, M. (2017). Exploring creative learning in the classroom: A multi-method approach. *Thinking Skills and Creativity*, 24, 250–267.
- Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. In C. Geertz (Ed.), *The interpretation of culture* (pp. 3–30). New York: Basic Books.
- *Geist, E., & Hohn, J. (2009). Encouraging creativity in the face of administrative convenience: How our schools discourage divergent thinking. *Education*, 130, 141–151.
- Gergen, K.J., & Gergen, M.M. (2014). Mischief, mystery, and moments that matter: Vistas of performative inquiry. *Qualitative Inquiry*, 20, 213–221.
- Getzels, J.W., & Csikszentmihalyi, M. (1976). *The creative vision: A longitudinal study of problem finding in art*. New York: Wiley.
- Glăveanu, V.P. (2013). Rewriting the language of creativity: The Five A's framework. *Review of General Psychology*, 17, 69.
- Glăveanu, V.P., & Lahlou, S. (2012). Through the creator's eyes: Using the subjective camera to study craft creativity. *Creativity Research Journal*, 24, 152–162.
- *Godart, F.C., & Mears, A. (2009). How do cultural producers make creative decisions? Lessons from the catwalk. *Social Forces*, 88, 671–692.
- Goldin-Meadow, S. (2003). *Hearing gesture: How our hands help us think*. Cambridge, MA: The Belknap Press of Harvard University Press.
- *Guay, D.M. (2000). Values, beliefs, behaviors, and artmaking in the middle grades: A teaching story. *Visual Arts Research*, 26, 38–52.
- Hektner, J.M., Schmidt, J.A., & Csikszentmihalyi, M. (2007). *Experience sampling method: Measuring the quality of everyday life*. Thousand Oaks, CA: Sage Publications.
- Henriksen, D., Mishra, P., & Mehta, R. (2015). Novel, effective, whole: Toward a NEW framework for evaluations of creative products. *Journal of Technology and Teacher Education*, 23, 455–478.
- *James, P. (1997). Learning artistic creativity: A case study. *Studies in Art Education*, 39, 74–88.
- Johnson, R.B. (1997). Examining the validity structure of qualitative research. *Education*, 118, 282–292.
- Jordan, B., & Henderson, A. (1995). Interaction analysis: Foundations and practice. *International Journal of the Learning Sciences*, 4, 39–103.
- *Kandemir, M.A., & Gur, H. (2007). Creativity training in problem solving: A model of creativity in mathematics teacher education. *New Horizons in Education*, 55, 107–122.
- Kane, M.T. (1992). An argument-based approach to validity. *Psychological Bulletin*, 112, 527.
- *Karademir, E. (2016). Investigation the scientific creativity of gifted students through project-based activities. *International Journal of Research in Education and Science*, 2, 416–427.
- Katz-Buonincontro, J. (2011, December). "Aesthetic" pedagogy in the context of leadership development: How does it work? [Special edition on the arts]. *Policy Futures in Education*, 9, 769–779.
- Katz-Buonincontro, J. (2015, September). Fanning the fires of conflict or leading with empathy? Creative problem solving through improvisational role-playing. Invited article for a Special Edition on aesthetics and empathy for the *Canadian Review of Art Education: Research and Issues (CRAE)*, 42, 26–43.
- Kaufman, J.C., Plucker, J.A., & Baer, J. (2008). *Essentials of creativity assessment*. New York: John Wiley & Sons.
- Kin, W.M.S., & Wong, Y.L. (2016). Fostering creativity from an emotional perspective: Do teachers recognise and handle students' emotions? *International Journal of Technology Design Education*, 26, 105–121.
- *Konstantinidou, E.P., & Zisi, V.Z. (2017). Do physical educators promote students' creativity? An observational analysis study. *Physical Educator*, 74, 420.
- Levitt, H.M., Bamberg, M., Creswell, J.W., Frost, D.M., Josselson, R., & Suarez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA publications and communications board task force report. *American Psychologist*, 73, 26–46.
- *Lorimer, M.R. (2016). Cultivating aesthetic and creative expression: An arts-based professional development project for migrant education. *Art Education*, 69, 35–43.
- *Mars, A. (2016). Past and present intertwining when learning is at stake: Composing and learning in a music theatre project. *International Journal of Education and the Arts*, 17, 1–28.
- Maxwell, J.A. (2010). Validity: How might you be wrong? In W. Luttrell (Ed.), *Qualitative-educational research: Readings in reflexive methodology and transformative practice* (pp. 279–287). New York, NY: Routledge.
- McNeill, D. (1992). *Hand and mind: What gestures reveal about thought*. Chicago, IL: University of Chicago Press.
- McNeill, D. (2005). *Gesture and thought*. Chicago, IL: University of Chicago Press.

- Merriam, S.B., & Tisdell, E.J. (2016). *Qualitative research: A guide to design and implementation* (4th edn). San Francisco, CA: Jossey-Bass.
- Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist*, 50, 741–749. <https://doi.org/10.1037/0003-066X.50.9.741>.
- *Meyer, A.A., & Lederman, N.G. (2013). Inventing creativity: An exploration of the pedagogy of ingenuity in science classrooms. *School Science and Mathematics*, 113, 400–409.
- Mishler, E.G. (2010). Validation in inquiry-guided research: The role of exemplars in narrative studies. In W. Luttrell (Ed.), *Qualitative educational research: Readings in reflexive methodology and transformative practice* (pp. 289–312). New York, NY: Routledge.
- *Nemiro, J., Larriva, C., & Jawaharlal, M. (2017). Developing creative behavior in elementary school students with robotics. *The Journal of Creative Behavior*, 51, 70–90.
- Patton, M. (2002; 1990). *Qualitative evaluation and research methods*. Newbury Park, CA: Sage.
- *Petsch, J. (2000). Creative encounters at the interaction factory. *Visual Arts Research*, 26, 85–93.
- *Pitri, E. (2013). Skills and dispositions for creative problem solving during the artmaking process. *Art Education*, 66, 41–46.
- *Pitts, C., Anderson, R.C., & Haney, M. (2018). Measures of instruction for creative engagement: Making metacognition, modeling, and creative thinking visible. *Learning Environments Research*, 21, 43–59.
- Plucker, J.A., & Makel, M.C. (2010a). Assessment of creativity. In R.J. Sternberg (Ed.), *Handbook of creativity* (pp. 48–73). New York: Cambridge University Press.
- Plucker, J.A., & Makel, M.C. (2010b). Assessment of creativity. In J.C. Kaufman, & R.J. Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 48–73). New York, NY: Cambridge University Press.
- Plucker, J. A., & Renzulli, J. S. (1999). Psychometric approaches to the study of human creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 35–61). New York: Cambridge University Press.
- Rhodes, M. (1961). An analysis of creativity. *The Phi Delta Kappan*, 42, 305–310.
- *Richardson, C., & Mishra, P. (2018). Learning environments that support student creativity: Developing the SCALE. *Thinking Skills and Creativity*, 27, 45–54.
- *Robson, S., & Rowe, V. (2012). Observing young children's creative thinking: Engagement, involvement and persistence. *International Journal of Early Years Education*, 20, 349–364.
- Rossmann, G.B., & Rallis, S.F. (1998). *Learning in the field: An introduction to qualitative research*. Thousand Oaks, CA: Sage.
- *Ruscio, J., Whitney, D.M., & Amabile, T.M. (1998). Looking inside the fishbowl of creativity: Verbal and behavioral predictors of creative performance. *Creativity Research Journal*, 11, 243–263.
- *Schacter, J., Thum, Y.M., & Zifkin, D. (2006). How much does creative teaching enhance elementary school students' achievement? *The Journal of Creative Behavior*, 40, 47–72.
- Schutt, R.K., Blalock, H.M., Jr, & Wagenaar, T.C. (1984). Goals and means for research methods courses. *Teaching Sociology*, 11, 235–258.
- Schwartz, M.S., & Schwartz, C.G. (1955). Problems in participant observation. *The American Journal of Sociology*, 60, 343–353.
- Shadish, W.R., Cook, T.D., & Campbell, D.T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Belmont, CA: Wadsworth Cengage Learning.
- Skinner, B.F. (1964). Behaviorism at fifty. In T.W. Wann (Ed.), *Behaviorism and phenomenology* (pp. 79–108). Chicago: The University of Chicago Press.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd edn). Thousand Oaks, CA: Sage.
- *Sullivan, F.R. (2011). Serious and playful inquiry: Epistemological aspects of collaborative creativity. *Journal of Educational Technology and Society*, 14, 55.
- Tedlock, B. (2005). The observation of participation and the emergence of public ethnography. In N.K. Denzin, & Y.S. Lincoln (Eds.), *The Sage handbook of qualitative research* (3rd edn, pp. 467–482). Thousand Oaks, CA: Sage.
- *Thomas, K. (2009). Creativity in artmaking as a function of misrecognition in teacher-student relations in the final year of schooling. *Studies in Art Education*, 51, 64–76.
- *Torrents, C., Castañer, M., Dinušová, M., & Anguera, M.T. (2010). Discovering new ways of moving: Observational analysis of motor creativity while dancing contact improvisation and the influence of the partner. *The Journal of Creative Behavior*, 44, 53–69.
- Treffinger, D., Young, G., Selby, E., & Shepardson, C. (2002). *Assessing creativity: A guide for educators*. Storrs, CT: The National Research Center on the Gifted and Talented.
- *Vuk, S., Tacol, T., & Vogrinc, J. (2015). Adoption of the creative process according to the immersive method. *CEPS Journal: Center for Educational Policy Studies Journal*, 5, 51.
- Waite, D. (2014). Teaching the unteachable: Some issues of qualitative research pedagogy. *Qualitative Inquiry*, 20, 267–281.
- *Walker, M.A. (2014). From theory to practice: Concept-based inquiry in a high school art classroom. *Studies in Art Education*, 55, 287–299.
- *Walmsley, B. (2013). Co-creating theatre: Authentic engagement or inter-legitimation? *Cultural Trends*, 22, 108–118.
- Watson, J.S. (2014). Assessing creative process and product in higher education. *Practitioner Research in Higher Education*, 8, 89–100.

Wielgosz, M., & Molyneux, P. (2015). "You get to be yourself:" Visual arts programs, identity construction and learners of English as an additional language. *Journal of Language, Identity, and Education*, 14, 275–289.

Yin, R.K. (2003). *Case study research: Design and method* (4th edn). Thousand Oaks, CA: Sage.

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